

# Gypsum Resources of Iowa

by Robert M. McKay

**In mining gypsum at Fort Dodge, overlying glacial deposits are removed and the deeply creviced surface of the gypsum is exposed. These crevices resulted from movement of water along intersecting fractures in the easily eroded gypsum.**



*Photo by Tim Kemmis.*

One of the softest minerals known to exist is the basis for one of Iowa's most durable mineral resource industries. Gypsum is a gray to white-colored mineral that can be easily scratched with a fingernail, and is referred to chemically as a hydrous calcium sulfate. Some of its other, perhaps more familiar, names are based on its various forms of occurrence. For example, alabaster is a massive form; satin spar is a fibrous variety; and selenite is its crystalline form. Gypsum often occurs in varying proportions with anhydrite (calcium sulfate), a slightly harder and more dense mineral that lacks water in its chemical make-up.

Both gypsum and anhydrite belong to an interesting group of minerals called evaporites, which are sedimentary deposits composed of salts precipitated from sea water. Evaporites form in shallow or near shore marine and lake environments where evaporation has

produced an unusually high concentration of dissolved salts, and where there is little or no circulation of fresh water. The precipitation of sediment from these hypersaline brines is associated with hot and relatively dry climatic conditions. Iowa's paleogeography at several times in the state's geologic past duplicated these environments of deposition and resulted in major accumulations of evaporite minerals. As a result, several geologic units in Iowa's underlying sedimentary rock sequence host economically significant deposits of gypsum. These include Jurassic, Mississippian, and Devonian-age formations.

Gypsum has several principal uses. Ground gypsum is added to Portland cement to slow the setting time of the cement. Pulverized gypsum, and to a lesser extent anhydrite, is used in agriculture as a soil conditioner and as an animal-food additive. The best known use of gypsum is as the principal ingredient in the manufacture of wallboard and plaster. This is possible because of gypsum's unique property of rehydrating with the addition of water after having been ground, calcined (baked to a powder), and mixed with other wallboard ingredients. Anhydrite is considered a contaminant in this case because it cannot be hydrated like gypsum.

Since the 1850s, people have utilized the gypsum deposits found in Iowa. The first published report of the large gypsum resource was by geologist David Dale Owen in 1852 after noting outcrops along the banks of the Des Moines River valley in the Fort Dodge area during an 1849 trip into Webster County. The "Fort Dodge Beds," as the gypsum-bearing formation subsequently became known, were regarded by Charles Keyes in 1893 to be "by far the most important bed of plaster-stone known west of the Appalachian chain, if not in the United States." A report by State Geologist Charles A. White in 1870 reported, "For want of direct railroad communication between this region and other parts of the state, the only use yet made of gypsum by the inhabitants (of Ft. Dodge) is the purposes of ordinary building stone. It has been so long and successfully used (for this purpose) that they now prefer it to the limestone of good quality, which also exists in the immediate area." During this time, the dimensioned gypsum stone was taken from the Cummin's quarries along Soldier Creek northwest of Fort Dodge. Natural exposures of gypsum still can be seen along this creek in Snell Municipal Park. It was in 1872 that Captain George Ringland, Webb Vincent, and Stillman T. Meservey formed a partnership, known as the Fort Dodge Plaster Mills, for the purpose of mining, grinding, and preparing gypsum for commercial products. These men constructed the first gypsum mill west of the Mississippi, at the head of what is now Gypsum Creek, and initiated the long and continuing history of gypsum production in Iowa.

Since the industry's founding in Ft. Dodge, the tonnage of crude gypsum mined statewide each year and its dollar value have steadily increased. In 1993 slightly less than 2.2 million short tons of crude gypsum were extracted from five surface mines and two underground mines operated by five companies at sites located in Des Moines, Marion, and Webster Counties. The average unit price was \$6.17 per ton and total value exceeded 12.2 million dollars. Nationally, Iowa ranked third among the states in value of crude gypsum produced during 1993, surpassed only by Texas and Oklahoma. Production from the Jurassic age Ft. Dodge Beds accounted for approximately two-thirds of Iowa's 1993 output. The companies operating surface mines and plants at Fort Dodge are: National

Gypsum Company, Georgia Pacific Corporation, Celotex Corporation, and the United States Gypsum Company.

The Jurassic gypsum deposits in the Fort Dodge area occur close to the land surface. This aided their initial discovery and also made the deposits economically attractive for surface-mining techniques. Scrapers or drag lines first remove most of the overburden, and backhoes then clean out the clay-filled fractures at the gypsum's surface. The exposed area of gypsum is then progressively blasted into piles of broken rock which are loaded into trucks and hauled to the crushing and wallboard plant. The accompanying photo shows a freshly exposed surface of gypsum ready to be mined. The overburden materials, consisting mostly of glacial deposits, have been removed. The unusual pattern of deep grooves seen on the uncovered surface is the result of solutional channels eroded into the easily soluble gypsum along planes of weakness or fractures in the rock. Following extraction of the gypsum, reclamation of the mined area is undertaken to restore the land surface and establish an effective vegetative cover.

Although the Fort Dodge area has been Iowa's premier gypsum producing region for more than a century, current estimates indicate that reserves will be exhausted within 40 to 50 years. If Iowa is to continue as a major gypsum producer, other deposits need to be explored and developed. Fortunately significant sulfate evaporites occur in the older and deeper Mississippian and Devonian rock systems in central, south-central, and southeast Iowa.

Mississippian evaporites occur in the St. Louis and Spergen Formations and were first discovered near Centerville in Appanoose County during exploratory drilling for coal by the Scandinavian Coal Company in 1910. The Centerville Gypsum Company eventually opened an underground mine to develop this deposit, but the mine closed in the early 1930s because of a slump in demand and because of high percentages of the contaminant anhydrite. Interest in the Mississippian gypsum was renewed after World War II, and exploration efforts at Albia in Monroe County, and Bussey and Harvey in Marion County proved the existence of significant subsurface gypsum deposits. Currently, Mississippian gypsum is extracted at the Durham Mine in Marion County by Kaser Corporation. Well records at the Iowa Geological Survey contain abundant notations of Mississippian evaporites, and their relatively shallow depths (200 to 600 feet) should encourage future development of these deposits.

Devonian evaporites are present in the subsurface over a broad area of the state. These deposits occur at several horizons in the Wapsipinicon and Cedar Valley Formations, and their existence was first noted in the early 1900s during the drilling of deep water wells. Iowa Geological Survey well records show that gypsum-anhydrite occurs in zones ranging in thickness from five to greater than 100 feet, and at depths between 400 and 2,000 feet. In 1960, the U.S. Gypsum Company opened the Sperry Mine in Des Moines County to become the first company to mine gypsum from the Wapsipinicon Formation. This room-and-pillar mine, at a depth of 616 feet, is the deepest mine in Iowa and the only mine from which Devonian gypsum is extracted. The potential for economic deposits of Devonian gypsum appears to be good, especially along the northern and

northeastern margins of evaporite occurrence, where thick horizons of evaporite have been encountered in drilling at depths of between 400 and 700 feet.

The future of the gypsum industry in Iowa seems bright, and it appears certain that Iowa will remain a major gypsum producing state well into the twenty-first century.

**Additional Reading:**

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